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Prescription of post-exposure prophylaxis for HIV-1 in the emergency room: correct transmission risk assessment remains challenging

Marzel, Alex ; Heinrich, Henriette ; Schilliger, Lukas ; Fehr, Jan S ; Günthard, Huldrych F ; Kouyos, Roger ; Rampini, Silvana K

Abstract: BACKGROUND: Limited data are available about the accuracy of PEP prescription in the emergency rooms. Here, we evaluated PEP prescription decision-making with respect to the risk of sexual HIV transmission and the exposed person‘s fear vis-à-vis HIV. METHODS: Using a risk-assessment algorithm, we retrospectively evaluated the adequacy of PEP prescription for all persons presenting at the emergency room of the University Hospital Zurich after consensual sex from 2007 to 2013. We used logistic regression to identify factors that correlate with risk-concordant and risk-discordant decisions. RESULTS: We documented 975 persons with a total of 1,051 visits for PEP: 83% were male, 71% were Swiss, and 37% were men-who-have-sex-with-men. In 74% of visits, the decisions were concordant with the risk evaluation algorithm (22% discordant, 4% unknown). In 61% (644/1051), PEP was prescribed; however, in 12% (76/644), the prescriptions were without indication of HIV transmission risk and were attributed to the exposed person's request. Importantly, in 10% (101/1051) of all visits, there were potential risks, but PEP was not prescribed, either because of physician's decision or exposed person's refusal. The presence of the source partner strongly correlated with appropriately withholding PEP (adjusted OR for giving PEP 0.05 95% C.I. 0.03, 0.08). CONCLUSION: We found that 22% of PEP decisions were risk-discordant due to exposed person's request, incorrect estimation of the sexual transmission risk by the physician, or exposed person's refusal to accept PEP. Emergency physicians may benefit from specialized risk-assessment training and patients from education in HIV transmission risk awareness.

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Prescription of Post-Exposure Prophylaxis for HIV-1 in the emergency room: Correct transmission risk assessment remains challenging

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Authors contributions

SKR, HH, AM and RK designed the concept of the study. JSF and HFG gave critical input to the study protocol. LS and HH extracted all data from the charts. AM designed the database and performed the statistical analysis with the input of RK and SKR. AM and HH wrote the manuscript, SKR did the final editing. All authors read and revised the manuscript.

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Potential conflicts of interest

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ABSTRACT

Background. Limited data are available about the accuracy of PEP prescription in the emergency rooms. Here, we evaluated PEP prescription decision-making with respect to the risk of sexual HIV transmission and the exposed person`s fear vis-à-vis HIV.

Methods. Using a risk-assessment algorithm, we retrospectively evaluated the adequacy of PEP prescription for all persons presenting at the emergency room of the University Hospital Zurich after consensual sex from 2007 to 2013. We used logistic regression to identify factors that correlate with risk-concordant and risk-discordant decisions.

Results. We documented 975 persons with a total of 1,051 visits for PEP: 83% were male, 71% were Swiss, and 37% were men-who-have-sex-with-men. In 74% of visits, the decisions were concordant with the risk evaluation algorithm (22% discordant, 4% unknown). In 61% (644/1051), PEP was prescribed; however, in 12% (76/644), the prescriptions were without indication of HIV transmission risk and were attributed to the exposed person's request. Importantly, in 10% (101/1051) of all visits, there were potential risks, but PEP was not prescribed, either because of physician's decision or exposed person's refusal. The presence of the source partner strongly correlated with appropriately withholding PEP (adjusted OR for giving PEP 0.05 95% C.I. 0.03, 0.08).

Conclusion. We found that 22% of PEP decisions were risk-discordant due to exposed person's request, incorrect estimation of the sexual transmission risk by the physician, or exposed person's refusal to accept PEP. Emergency physicians may benefit from specialized risk-assessment training and patients from education in HIV transmission risk awareness.

Keywords: post-exposure prophylaxis; sexual risk; emergency room; decision-making; HIV transmission; patient demand

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INTRODUCTION

Preventing HIV transmission is a major public health challenge [1]. Combined antiretroviral therapy (cART) is a valuable tool in this effort, either as pre-exposure (PrEP) [2] or post-exposure prophylaxis (PEP) [3]. PEP is highly effective in non-human primates in reducing the risk of SIV transmission by 77–95% [4]. The main factors determining its effectiveness are the lag-time between exposure and start of cART and its duration of intake [4, 5]. In humans, PEP with Zidovudine alone reduced the risk of HIV transmission by 80% after occupational exposure [6]. In 1997, the Swiss Federal Office of Public Health (FOPH) recommended PEP after a HIV sexual risk exposure [7].

After the introduction of cART by end of the 1990s, it was controversial whether PEP should be prescribed in non-occupational (sexual) contacts [8-10]. Today, according to the EACS guideline [11] and the FOPH guideline updated in 2006 [12], PEP is primarily recommended for persons having unprotected sex (*i.e.,* anal, vaginal or receptive oral sex with ejaculation) with a viraemic HIV-positive partner or a partner with unknown serostatus but with a presence of HIV risk factors (*i.e.*, men-who-have-sex-with-men (MSMs), sex workers, intravenous drug users (IDU) or persons from a country with a high HIV prevalence). PEP is not recommended for persons having unprotected sex with an HIV-infected partner on successful cART. In all other situations with unprotected sex, individual risk should be evaluated. The internal guidelines from the University Hospital of Zurich (USZ), relevant to the analyzed period, were largely derived from the FOPH guideline, but left a lot of room for subjective risk evaluation by the physician, stating that: "*PEP should be prescribed in the following situations: unprotected vaginal, anal or oral receptive intercourse with an HIV-positive partner or during menstruation. PEP should not be prescribed in cases of unprotected intercourse with a partner with unknown HIV status. In this case, fears and needs*

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of the exposed person should be taken into account. Neither categorical non-prescription nor uncritical prescription can be encouraged."

Previous studies have already shown that the decision to use PEP is influenced by the experience of the physician-in-charge [10], the emergency room (ER) setting [8], and the exposed person`s request [10]. Notwithstanding, people taking PEP, frequently suffer from side effects that result in poor adherence, and as a result, only 65–78% finish the 4-week PEP regimen [13, 14]. Thus, the physician-in-charge must weigh the pros and cons of PEP carefully in each case.

Here we systematically assessed PEP decision-making and factors that influence PEP decision-making in daily practice in a large ER of a tertiary care hospital. Identifying these factors would be a major step in optimizing decision-making. We retrospectively evaluated all persons seeking advice on PEP at the ER of the USZ between 2007 and 2013. We then reviewed whether the decision-making was in agreement with a risk assessment algorithm for PEP prescriptions. In particular, we collected data on the demographic factors of the persons, the kind of sexual risk taken, the experience of the ER physician, and eventually the person's request and correlated these data with the evaluated decisions.

METHODS

Ethics

The study was approved by the institutional review board of the USZ (KEK-ZH-Nr. 2013-0006).

Study Design

We identified, in a retrospective and cross-sectional manner, all persons admitted to the ER of the USZ seeking advice for HIV PEP in 2007–2013 by screening all electronic charts from that period for the following keywords: post-exposure-prophylaxis, PEP, risk,

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exposure, sexual intercourse, and sex. Non-consensual sex and occupational HIV exposure were excluded from the analysis. This ER has ~17,000 general internal medicine consultations per year.

Demographic Data and Sexual History

We collected the following data from the identified electronic charts for each exposed person: i) demographic data, ii) a detailed sexual history, including type of sexual intercourse (*i.e.* insertive, receptive, versatile (insertive and receptive), anal, vaginal, oral, smear of body fluids on healthy or wounded skin or mucous membranes, hand/feet to genitals contact, condom use, condom dysfunction), hours since exposure, or additional risk factors for HIV transmission (*i.e.,* menstruation, ejaculation and sexually transmitted infections), and iii) the result from the HIV screening test at presentation. Based on the retrospective nature of the study it was not possible to define oral sex with or without sperm exchange; thus we considered unprotected oral sex as a risk situation. By default, every person seeking PEP at the ER should be tested for HIV on the spot. This screening was done with the 4th generation HIV antigen/antibody (Ag/Ab) combo screening test (Abbot) and its result should be available by 4 hours at the latest. Furthermore, for each source partner, we collected the gender, the risk group (*i.e.,* MSM, sex worker, from endemic country, IDU), last known HIV status, and the result of the HIV screening test performed at the ER if he presented together with the exposed person. If the presenting source partner was already known to be HIV positive, we extracted the last documented viral load value from his/her electronic chart. If no viral load was available, we requested a HIV-1 RNA viral load (HIV-1 Test, version 2.0 (Roche)). Eventually, we collected the data on whether PEP was prescribed or not, the post-graduate education of the physician-in-charge, and the rational for the decision.

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Risk Assessment Algorithm for PEP Decision-Making

To assess the adequacy of PEP decision-making, we developed an epidemiology-based risk assessment algorithm taking into account known risk factors for HIV transmission (Figure 1). A time lag of >72 hours between sexual exposure and ER visit renders PEP inefficient and in these cases PEP was not indicated. Next, we ascertained the HIV status of the source partner, either by a negative HIV test done within the past three months or otherwise the result of an on-the-spot HIV test. In the case of HIV-infection but a HIV RNA copy number <50/ml within the last three months or at presentation, we considered PEP as not indicated. The 3-month cut-off for having an HIV RNA below the detection limit is based on the 3-month intervals we see the HIV patients in our outpatient clinic which is the standard of care. If the HIV status of the source partner was unknown, we classified the incident as low HIV transmission risk and PEP was not indicated unless the source partner belonged to a high-risk group (Figure 1).

We used this algorithm to categorize the PEP decisions as concordant (*i.e.,* "prescribed-and-indicated" or "not-prescribed-and-not-indicated") or discordant ("prescribed-while-not-indicated" or "not-prescribed-while-indicated").

Statistical Analysis

Bivariate P-values for categorical variables were calculated using chi-square test and Fisher's exact test, and for numerical variables a Mann-Whitney U test was used. We used logistic regression to estimate correlating factors with prescribing or not prescribing PEP, stratified by concordant and discordant decisions (two models). Statistical analysis was performed with R (version 3.2.3, http://cran.r-project.org).

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RESULTS

Demographic Data of the Exposed Persons

Between 2007 and 2013, 975 persons visited the ER 1,051 times to get PEP: 911/975 (93%) presented once, and 64/975 (6.5%) presented repeatedly with one person presenting seven times and a median interval of 1.7 years (interquartile range (IQR) 0.76–2.68) between the first and the last visit. MSMs were overrepresented among those with more than one visit (37/64 (57%) vs 315/911 (35%), Fisher's exact test $P<0.001$). The number of visits remained stable over time with a median of 149 visits per year (IQR 133–162) (Figure 2). The median age at first visit was 31 years (IQR 26–38). Out of all visits, in 872/1051 (83%) the exposed were male, 746/1051 (71%) were Swiss, 61/1051 (5.8%) were German, 42/1051 (4%) were Italian, and 202/1051 (19.2%) were from various countries. In 393/1051 (37.4%) visits, sexual contact between men was documented.

A large proportion of all PEP visits (43%, 451/1051) were on weekends (Table 1); 376/1051 (36%) visits were between noon and 6:00 pm, and only 181/1051 (17%) were between midnight and 6:00 am. The median self-reported time lag between sexual intercourse and the ER visit was 20 hours (IQR 10-42), with 165/981 (17%) presenting after 48 hours and 46/981 (4.7%) after 72 hours (for 70 visits time since exposure was missing). MSM presented sooner after exposure than non-MSM (median 16 hours (IQR 5-32) vs. 24 hours (IQR 12-48), Mann-Whitney P <0.0001) and also presented more on weekends (47% (185/393) vs. 40% (266/658), Fisher's Exact Test P=0.04).

In 4/1051 (0.4%) visits, the exposed person turned out to be HIV positive already at presentation.

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Condom Use and Type of Sexual Intercourse

The exposed persons reported condomless sex in 527/1051 (50.1%) visits, condom breakage or slippage (condom dysfunction) in 433/1051 (41.2%) visits, and protected sex in 23/1051 (2.2%) visits. In 68/1051 (6.5%) visits, data were missing. MSMs had mainly anal sex with 320/393 (81%) incidents. The anal sex was receptive in 120/320 (37%) visits, insertive in 84/320 (26%), and versatile in 15/320 (5%), and data were missing in 101/320 (32%) visits. Heterosexual men and women had mainly vaginal intercourse with 387/448 (86%) and 153/176 (86%), respectively.

Demographic Data of the Source Partners

The source partner belonged to a group at high risk of being HIV infected in 670/1051 (63.7%) visits. More specifically, 401/1051 (38%) were MSMs, 256/1051 (24%) were sex-workers, 46/1051 (4.3%) were from an HIV endemic region, and 11/1051 (1%) were IDU. The source partner belonged to more than one risk group in 41/1051 (4%) visits.

In 20% (211/1051) of the visits the source partner did not belong to a risk group and hasn't presented, and his/her HIV status was unknown. This represents the fraction of low risk presentations.

Source partners accompanied the exposed person in 170/1051 (16%) of the visits. However, we observed a decline in source partner presentation from 23% (27/114) in 2007 to 11.8% (15/129) in 2013 (P for trend =0.042). Females were twice as likely to present with the source partner than males (27.9% (50/179) vs. 13.8% (120/872), Fisher's exact test, $P<0.001$). The source partner was HIV infected in 131/1051 (12%) of the visits as self-reported or documented in his/her chart at the USZ. Out of those, for 60 (60/131, 45%), we could retrieve a viral load value, 23 were documented and within last three months of presentation (others were either self-reported or more than 3 months old). In 65% (39/60), the

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viral load was suppressed (<50 copies/ml), and for the rest, the median viral load was 3500 IQR (456-10,000) copies/ml.

We did not observe an increase in sexual intercourse with HIV-infected source partners over time (P for trend 0.48).

Revision of the PEP Decision-Making

PEP was prescribed in 644/1051 (61%) visits overall (Table 1). The PEP decision-making of the physician-in-charge was in accord with the risk assessment algorithm in 779/1051 (74%) visits (*i.e.,* 485 "prescribed-and-indicated" and 294 "not-prescribed-and-not-indicated") (Figure 3). In 226/1051 (22%) visits, the decision-making was discordant (*i.e.,* 125/226 (55%) "prescribed-while-not-indicated" and 101/226 (45%) "not-prescribed-while-indicated") (Supplementary Table 1http://links.lww.com/QAI/A956).

The main reason for prescribing PEP when it was not indicated was the person's request in a low-risk situation in 76/125 (61%) visits. While women made up only 78/644 (12%) of all prescribed PEPs, they were overrepresented with 27/76 (35%) in the category "prescribed-while-not-indicated" due to their request (Fisher's exact test P <0.0001). The remaining 49/125 (39%) PEPs prescribed in the category "prescribed-while-not-indicated" were explained by an incorrect interpretation of the sexual risk situation by physicians. Notably, in 485/644 (75%) visits, PEP was prescribed concordantly to the risk assessment algorithm.

Overall, there were 586 putative risk situations where PEP was indicated (*i.e.,* 485 prescribed-and-indicated (concordant) plus 101 not-prescribed-while-indicated (discordant)) (Figure 3). In these 101/586 (17%) risk situations, PEP was not prescribed because of exposed person's refusal (31/101, 31%), the physicians not following the recommendation to give PEP within the lag-time of 72 h between the sexual incident and presentation (9/101, 9%), and the physician's incorrect interpretation of the sexual risk for HIV transmission (61/101, 60%).

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Notably, 20/61 (33%) sexual contacts were oral, and oral sex has a lower HIV transmission risk than vaginal or anal sex, especially if there is no exchange of sperm or blood. In 2/20 (10%) oral sex incidents, the source partners were HIV infected, and one had 10^4 HIV RNA copies/mL in the blood. Infectious disease (ID) specialists took the decisions in 10/20 (50%) of these oral-sex-only incidents, which is significantly more often than their overall involvement in decision-making (179/1051 (17%), Fisher's exact test P<0.001). Notwithstanding, in 41/61 incidents a high risk for HIV transmission existed. Considering a total of 407 visits in which no PEP was prescribed, these 41/407 (10%) missed opportunities represent a considerable number in the context of HIV prevention. Finally, visits in which contact with a sex worker took place were significantly over-represented in this category of not-prescribed-while-indicated (43.6%, 44/101 vs. 22.3% 212/950, Fisher`s exact test P < 0.001).

We have not observed a change in the fraction of discordant decisions with time (Figure 2). In the remaining 46/1051 (4%) visits, the data were too incomplete to categorize the decision-making. The main missing variables were sex of the source partner (hence it was not clear if the exposed person belonged to the MSM risk group), condom use, and time since exposure, or combination of those.

Factors Correlating with PEP Decision-Making

First, we used multivariable logistic regression to define factors, which correlate with concordant decisions. Repeated visits to the ER (odds ratio (OR) 2.78; 95% confidence interval (C.I.) 1.54–5.03) and PEP decision-making by ID specialists (OR 1.85; 95% C.I. 1.09–3.12) were associated with concordant decisions on PEP prescription (*i.e.*, "prescribed-and-indicated"), and attendance of the source partner (OR 0.05; 95% C.I. 0.03–0.08) and female sex (OR 0.16; 95% C.I. 0.10–0.27) with concordant decisions on non-prescription (*i.e.*, "not-prescribed-and-not-indicated") (Table 2).

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In a second model, we used multivariable analysis to describe factors that might lead to discordant decisions. Female sex (OR 11.38; 95% C.I. 4.10-31.6) and visits to the ER between 06:00 AM and noon (OR 2.92; 95% C.I. 1.01-8.42) were associated with discordant decisions (*i.e.*, "prescribed-while-not-indicated"). Decision-making by ID specialists as opposed to residents in internal medicine was associated with the decision category "not-prescribed-while-indicated" (OR 0. 38; 95% C.I. 0.18–0. 81). This association became non-significant when the oral-sex-only visits were excluded (OR 0.47; 95% C.I. 0.20-1.07).

DISCUSSION

Accurately estimating the risk of HIV transmission after consensual sex and determining the necessity of PEP prescription are challenges for the ER physicians [8]. Here we retrospectively examined the accuracy of PEP prescriptions using a feasible risk assessment algorithm based on epidemiological HIV transmission risk and identified factors that correlate with risk-concordant decision-making. Our main findings were that i) the ER physician estimated the sexual risk for HIV transmission correctly in most visits (74%); however, in 10% of visits, PEP was not prescribed despite of a risk situation. Furthermore, 12% of all PEP prescriptions were based on the exposed person's request rather than an appropriate indication. ii) Repeated visits and ID expert opinion were factors associated with correct prescription of PEPs, whereas consultation in the morning and female sex were associated with equivocal PEP prescriptions. iii) The presence of the source partner resulted in correctly withholding PEP.

Our risk assessment algorithm is in-line with the latest EACS and FOPH guidelines and was used to retrospectively define HIV transmission risk and prescription indications. The internal USZ guidelines, relevant to the analyzed period, did not specify the risk groups, hence giving leeway to the clinician in charge and requesting a detailed knowledge about HIV transmission risk. In addition, it was stated that the subjective fears and concerns of the

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exposed person should be taken into account, meaning that some PEP were prescribed on demand in low risk situations. Here our aim was to estimate the objective risk of HIV transmission in each situation and to define factors correlating with correct and incorrect PEP prescriptions, not to describe the rate of adherence to internal guidelines.

We found that 12% of all PEP were prescribed based on exposed person's request ("prescribed-while-not-indicated"). This might be due to inadequate counseling by the ER physician, limited knowledge of HIV transmission risk among them, or exposed person's demand because of fear of contracting HIV. Notably, patient request and uncertainty by the physicians affect drug prescription habits [15, 16]. More women fell into this category; it can be hypothesized that women may be more concerned about HIV or simply look for maximum protection [17]. In addition, the gender of the physician-in-charge may influence the decision-making, an issue not examined here [18-21].

In 17% of the sexual incidents with a given risk for HIV transmission PEP was not prescribed ("not-prescribed-while-indicated"). This was due to exposed person's refusal (n=31) and physician's decision (n=70). We speculate that balancing the actual risk of acquiring HIV against the potential side effects of PEP led to its refusal [13, 14]. A word of caution must be added about the rather high number of physician decisions against PEP prescription: oral intercourse is a low risk situation with an estimated HIV transmission rate of <4/10,000 incidents as opposed to insertive anal intercourse with 11/10,000 [22-24]. We did not include such subtle distinctions in our risk assessment algorithm as ER physicians were not specifically trained to integrate the detailed sexual history into the assessment of the HIV transmission risk. In addition, sexual history may be unreliable, and the notes in the charts are sometimes rudimentary, thus rendering them not useful for retrospective risk assessment. Finally, the local recommendations did not differentiate between sexual risks taken. That is why the ER physicians and, in particular, ID specialists might have advised

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against PEP after taking into account a low-risk situation (oral sex only), and this may explain the relatively high number of discordant decisions.

The presence of the source partner in the ER significantly improved the odds of concordant decision-making. The immediate HIV testing of both sexual partners certainly defines the transmission risk in a best way. Importantly, current HIV tests are very sensitive and detect antigen as well as antibodies [25], making it unlikely that an acute HIV infection is missed. Thus, persons seeking advice for PEP should be encouraged to present with their source partner [22] when receiving information about PEP.

Remarkably, the number of visits to our ER for PEP remained stable over the observation period. This can be explained by the interplay of the following factors. On the one hand, more risk-behavior as the result of "the Swiss Statement" in 2008 that "HIV-positive persons on ART with undetectable viral loads and no other STIs may engage in condomless sex, while in a stable relationship" [26-28]. On the other hand, concern of an HIV infection may be less, leading to a smaller probability of demanding PEP when risk behavior occurred. This is backed up by recent studies showing an increase in unprotected sex in HIV-infected heterosexuals and MSM in both occasional and stable partnerships [29]. Alternatively, persons who engage in high-risk sexual activities and do not present to the ER may be ignorant about PEP and its benefit for reducing HIV transmission [30]. Indeed, knowledge of PEP was unexpectedly low (48.7%) even among HIV-infected individuals overall in the UK [31]. In Switzerland, even the long-lasting public health campaigns directed to HIV transmission prevention do not promote PEP. However prescriptions doubled in a local gay health community center (www.mycheckpoint.ch/en/zh, Bruggmann P., personal communication) in the corresponding period. For some fraction of these, the prescribed PEP might have been obtained because of a claimed but non-existent risk situation with the intention, on the recipient's side, to use it as PrEP.

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We found that only 6.5% of all persons repetitively showed up at the ER for PEP. This number is substantially lower than the 20% reported in previous studies [32-35] and, thus, suggests that PEP is unlikely to promote higher sexual risk behavior, which is consistent with a report by Martin et al. [36]. However, persons with high-risk sexual behavior, presenting repetitively for PEP, most likely would be the ideal candidates for HIV PrEP.

In summary, PEP decision-making was adequate in the majority of visits; however, in every fifth visit, it was wrong. To benefit most from PEP, we see the need for further improvement in PEP decision-making and counseling. Thus, ER physicians may benefit from a specialized risk assessment training that might incorporate the use of risk assessment algorithms. On the exposed person's side, future public health campaigns could increase PEP awareness alongside with knowledge about the risk situations that justify presentation. A special emphasize can be made on the benefits of presentation together with the source partner.

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480 **FIGURE LEGENDS**

481

482 **Figure 1.** HIV transmission risk-assessment algorithm used for the revision of PEP prescribed
483 in the ER. All presentations after unprotected sexual intercourse (*i.e.,* condomless sex or
484 condom dysfunction) were retrospectively evaluated using this risk-assessment algorithm.

485

486 **Figure 2.** PEP visits to the emergency room of University Hospital Zurich by year and
487 according to the categories defined by the risk assessment algorithm. The annual number of
488 visits is shown on the x-axis. *P* for trend 0.55. 46 visits with unknown category were excluded
489 from the y-axis for clarity.

490

491 **Figure 3.** Flowchart of the study and the categories of PEP decisions.

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Table 1. Demographic data and sexual history divided by PEP prescription outcome.

	Overall	**Not-Prescribed**	**Prescribed**	***P***
n	1051	407	644	
Age (median [IQR])	32.0 [26.0, 38.0]	30.0 [26.0, 37.0]	32.0 [27.0, 38.0]	0.006
Sex, female (%)	179 (17.0)	101 (24.8)	78 (12.1)	<0.001
Swiss nationality (%)	746 (71.0)	278 (68.3)	468 (72.7)	0.147
MSM (%)	393 (37.4)	106 (26.0)	287 (44.6)	<0.001
>1 PEP visit (%)	140 (13.3)	38 (9.3)	102 (15.8)	0.003
Weekend (%)	451 (42.9)	175 (43.0)	276 (42.9)	1.000
Hours since exposure (median [IQR])	20.0 [10.0, 42.0]	24.0 [10.0, 49.0]	18.0 [10.0, 38.0]	<0.001
Day time (%)				0.009
Midnight-6 AM	181 (17.2)	74 (18.2)	107 (16.6)	
6 AM - Noon	182 (17.3)	51 (12.5)	131 (20.3)	
Noon - 6 PM	376 (35.8)	148 (36.4)	228 (35.4)	
6 PM - Midnight	312 (29.7)	134 (32.9)	178 (27.6)	
Year (%)				0.317
2007	114 (10.8)	48 (11.8)	66 (10.2)	
2008	137 (13.0)	50 (12.3)	87 (13.5)	
2009	168 (16.0)	72 (17.7)	96 (14.9)	
2010	156 (14.8)	57 (14.0)	99 (15.4)	
2011	198 (18.8)	64 (15.7)	134 (20.8)	
2012	149 (14.2)	64 (15.7)	85 (13.2)	
2013	129 (12.3)	52 (12.8)	77 (12.0)	
Condom (%)				0.001
Condom dysfunction	433 (41.2)	170 (41.8)	263 (40.8)	
Condomless sex	527 (50.1)	192 (47.2)	335 (52.0)	
With condom	23 (2.2)	18 (4.4)	5 (0.8)	
Unknown	68 (6.5)	27 (6.6)	41 (6.4)	
Type of intercourse				
Anal (%)	359 (34.2)	84 (20.6)	275 (42.7)	<0.001
Vaginal (%)	543 (51.7)	244 (60.0)	299 (46.4)	<0.001
Oral (%)	157 (14.9)	73 (17.9)	84 (13.0)	0.038
Only oral (%)	94 (8.9)	52 (12.8)	42 (6.5)	0.001

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	Overall	Not-Prescribed	Prescribed	*P*
Source partner risk group				
MSM (%)	401 (38.2)	107 (26.3)	294 (45.7)	<0.001
Sex worker [a] (%)	256 (24.4)	74 (18.2)	182 (28.3)	<0.001
Endemic country (%)	46 (4.4)	13 (3.2)	33 (5.1)	0.182
Injecting-drug-user (IDU) (%)	11 (1.0)	2 (0.5)	9 (1.4)	0.274
HIV status of the source partner (%)				<0.001
Negative	175 (16.7)	140 (34.4)	35 (5.4)	
Positive	131 (12.5)	16 (3.9)	115 (17.9)	
Unknown	745 (70.9)	251 (61.7)	494 (76.7)	
Source partner presented the same day (%)	170 (16.2)	138 (33.9)	32 (5.0)	<0.001
Deciding physician (%)				0.062
Resident in internal medicine	849 (80.8)	343 (84.3)	506 (78.6)	
Infectious disease specialist	179 (17.0)	58 (14.3)	121 (18.8)	
Internal medicine specialist	23 (2.2)	6 (1.5)	17 (2.6)	

[a] Sex work in Switzerland is legal and regulated.
[b] P-values for categorical variables were calculated using chi-square test, for age and hours since exposure a Mann–Whitney U test was used.

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Table 2. Factors correlating with PEP decision-making. Multivariable analysis using logistic regression of factors associated with prescription of PEP or not (binary dependent variable). Two separate models are shown, within the risk-concordant decisions (left) and within the risk-discordant decisions (right). Note that risk-behavior was not included as a predictor because it is a major component of the outcome (used to classify decisions as justified or not).

	Dependent variable: PEP prescribed (Yes/No)			
	Risk concordant decisions		**Risk discordant decisions**	
	Univariable (OR, 95% C.I)	**Multivariable** (OR, 95% C.I)	**Univariable** (OR, 95% C.I)	**Multivariable** (OR, 95% C.I)
Sex				
Men (ref.)		1		1
Women	0.14** (0.09, 0.22)	0.16**(0.10, 0.27)	11.18** (4.24, 29.48)	11.38** (4.10, 31.59)
Age	1.03** (1.01, 1.05)	1.02 (0.99, 1.04)	0.97 (0.94, 1.01)	0.98 (0.94, 1.01)
Nationality				
Non-Swiss (ref.)		1		1
Swiss	1.30 (0.95, 1.78)	1.01 (0.68, 1.51)	1.04 (0.57, 1.92)	1.65 (0.80, 3.41)
More than one visit				
No (ref.)		1		1
Yes	2.42** (1.50, 3.91)	2.78** (1.54, 5.03)	0.72 (0.30, 1.70)	0.68 (0.26, 1.83)
Post-graduate education of the physician in charge				
Internal medicine resident (ref.)		1		1
Infectious disease specialist	2.28** (1.46, 3.56)	1.85* (1.09, 3.12)	0.48* (0.25, 0.92)	0.38* (0.18, 0.81)
Internal medicine specialist	4.17 (0.93, 18.81)	3.32 (0.64, 17.12)	0.22 (0.02, 2.20)	0.27 (0.02, 2.83)
Source presented with the exposed				

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No (ref.)		1		1
Yes	0.05** (0.03, 0.09)	0.05** (0.03, 0.08)	2.34 (0.72, 7.58)	3.61 (0.92, 14.12)
Presentation during weekend				
No (ref.)		1		1
Yes	0.96 (0.71, 1.28)	1.23 (0.85, 1.78)	1.13 (0.65, 1.94)	1.02 (0.55, 1.92)
Time of presentation				
Midnight -6 AM (ref.)		1		1
6 AM -Noon	1.73* (1.04, 2.90)	1.65 (0.88, 3.12)	1.76 (0.71, 4.36)	2.92* (1.01, 8.42)
Noon-6 PM	0.98 (0.64, 1.50)	0.94 (0.55, 1.60)	1.33 (0.61, 2.90)	1.77 (0.70, 4.46)
6 PM -Midnight	0.78 (0.51, 1.21)	0.78 (0.45, 1.35)	1.25 (0.56, 2.78)	1.44 (0.56, 3.68)
Year	1.03 (0.95, 1.11)	0.93 (0.84, 1.03)	0.92 (0.79, 1.06)	0.94 (0.79, 1.11)

*p<0.05; **p<0.01. All shown variables were included in the multivariable model.

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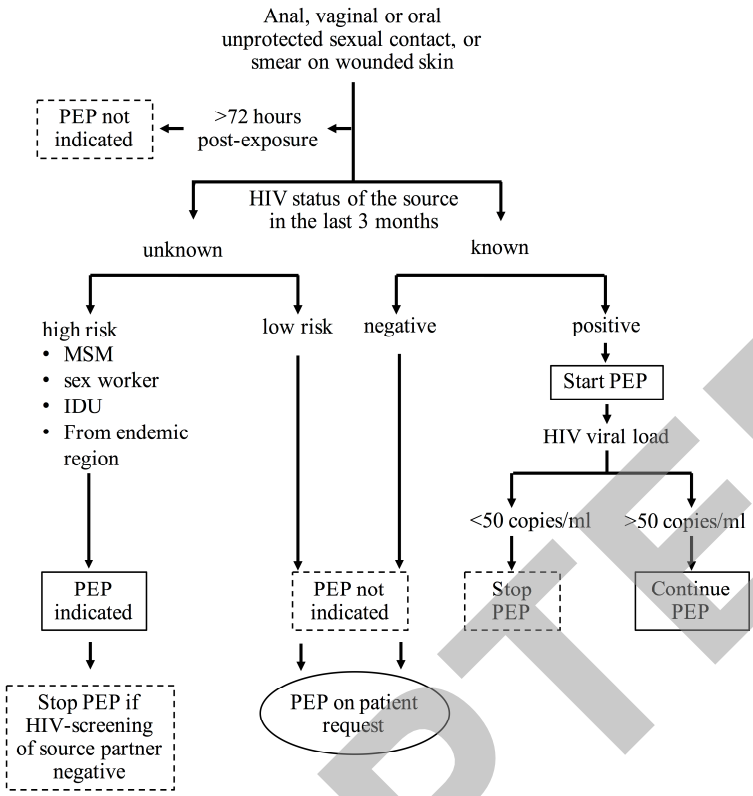

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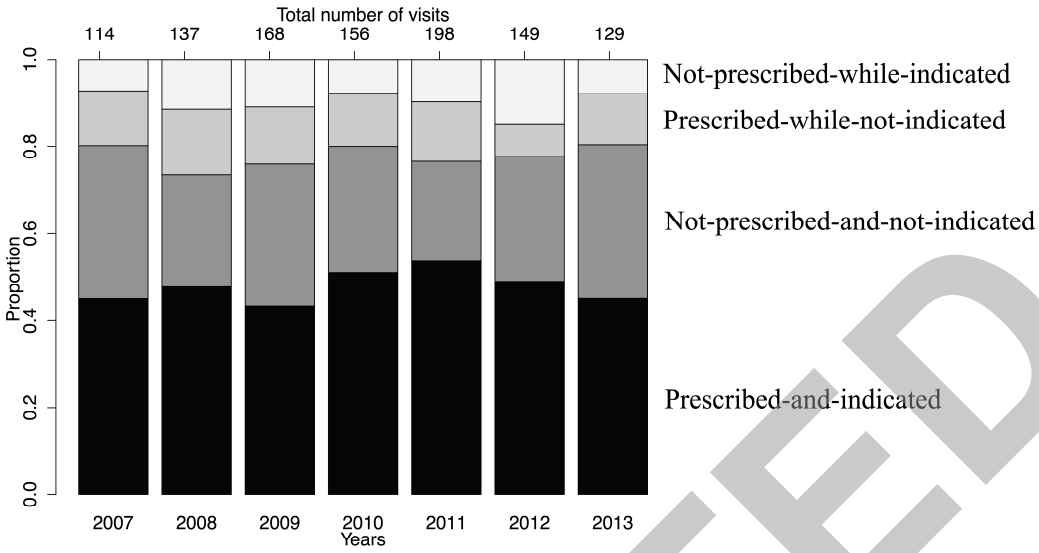

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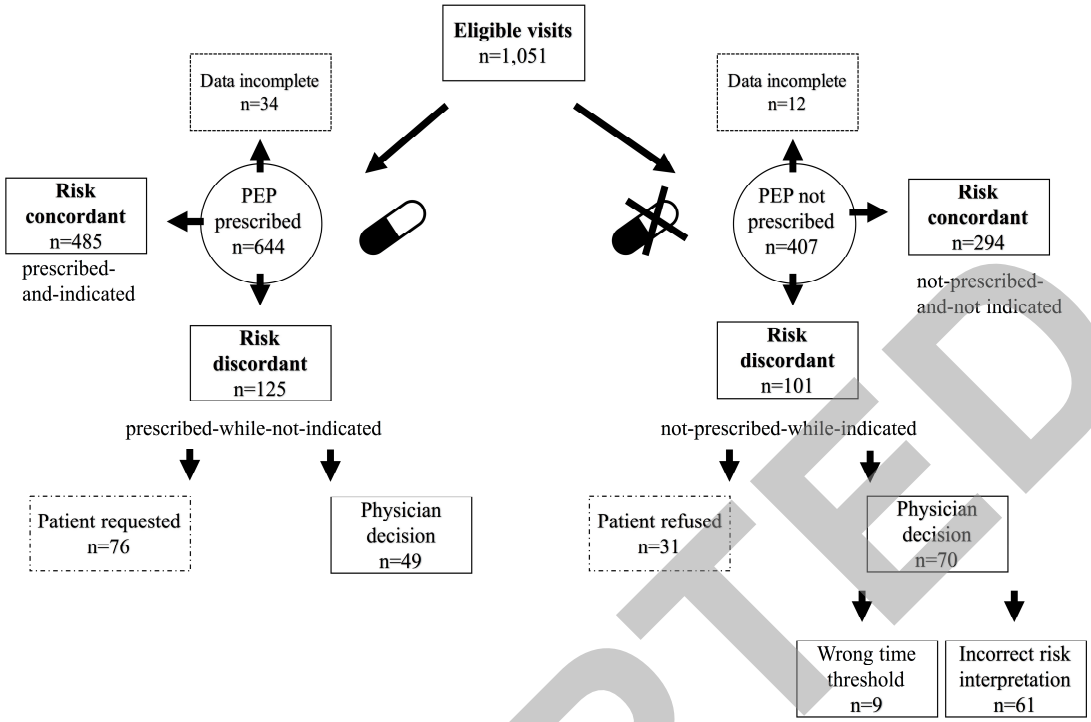

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